NATIONAL GUIDELINE CLEARINGHOUSE™ (NGC) GUIDELINE SYNTHESIS

PREVENTION, DIAGNOSIS AND TREATMENT OF PEDIATRIC BRONCHIOLITIS

Guidelines

1. **American Academy of Pediatrics (AAP) Subcommittee on Diagnosis and Management of Bronchiolitis**. Diagnosis and management of bronchiolitis. Pediatrics 2006 Oct;118(4):1774-93. [166 references]
2. **Cincinnati Children's Hospital Medical Center (CCHMC)**. Evidence-based clinical practice guideline for medical management of bronchiolitis in infants less than 1 year of age presenting with a first time episode. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2006 May. 13 p. [85 references]
3. **Scottish Intercollegiate Guidelines Network (SIGN)**. Bronchiolitis in children. A national clinical guideline. Edinburgh (Scotland): Scottish Intercollegiate Guidelines Network (SIGN); 2006 Nov. 41 p. (SIGN publication; no. 91). [110 references]

INTRODUCTION:

A direct comparison of the American Academy of Pediatrics (AAP), Cincinnati Children's Hospital Medical Center (CCHMC) and Scottish Intercollegiate Guidelines Network (SIGN) recommendations for the diagnosis and treatment of pediatric bronchiolitis is provided in the tables below.

The guidelines are fairly similar in scope, addressing the prevention, diagnosis and treatment of pediatric bronchiolitis. AAP and SIGN reviewed the CCHMC guideline in developing their recommendations. The CCHMC guideline updates a previous version.

The tables below provide a side-by-side comparison of key attributes of each guideline, including specific interventions and practices that are addressed. The language used in these tables, particularly that which is used in Tables 4, 5 and 6, is in most cases taken verbatim from the original guidelines:

- Table 1 provides a quick-view glance at the primary interventions considered by each group.
- Table 2 provides a comparison of the overall scope of both guidelines.
- Table 3 provides a comparison of the methodology employed and documented by both groups in developing their guidelines.
- Table 4 provides a more detailed comparison of the specific recommendations offered by each group for the topics under consideration in this synthesis, including:
    - Prevention/Transmission Reduction

- Diagnosis
  - Physical Examination
  - Laboratory and Radiologic Investigations
- Treatment
  - Pharmacologic Therapy
  - Non-Pharmacological Therapy
- Hospital Discharge Criteria
- Education
- Follow-Up Care and Referral
- Supporting References

- Table 5 lists the potential benefits and harms associated with the implementation of each guideline as stated in the original guidelines
- Table 6 presents the rating schemes used by AAP, CCHMC, and SIGN to rate the level of evidence and/or the strength of the recommendations.

A summary discussion of the areas of agreement and areas of differences among the guidelines is presented following the content comparison tables.

Abbreviations:

- AAP, American Academy of Pediatrics
- CCHMC, Cincinnati Children's Hospital Medical Center
- RSV, respiratory syncytial virus
- SIGN, Scottish Intercollegiate Guidelines Network

TABLE 1: COMPARISON OF INTERVENTIONS AND PRACTICES CONSIDERED
("✓" indicates topic is addressed)

	AAP (2006)	CCHMC (2006)	SIGN (2006)
Prevention/Transmission Reduction			
Palivizumab prophylaxis	✓	✓	✓
Prevention measures	✓	✓	✓
Transmission reduction measures	✓	✓	✓
Diagnosis			
Physical Examination	✓	✓	✓
Laboratory and Radiologic Investigations	✓	✓	✓

Treatment			
Pharmacological therapy	✓	✓	✓
Non-Pharmacological Therapy	✓	✓	✓
Hospital Discharge Criteria		✓	✓
Education	✓	✓	✓
Follow-Up Care/Referral		✓	✓

TABLE 2: COMPARISON OF SCOPE AND CONTENT	
Objective and Scope	
AAP (2006)	To provide an evidence-based approach to the diagnosis, management and prevention of bronchiolitis in children 1 month to 2 years of age.
CCHMC (2006)	In children age less than 12 completed months and presenting for the first time episode with bronchiolitis typical in presentation and clinical course, the objectives of this guideline are to: • Decrease the use of unnecessary diagnostic studies • Decrease the use of medications and respiratory therapy without observed improvement • Improve the rate of appropriate admission • Decrease the rate of nosocomial infection • Improve the use of appropriate monitoring activities • Decrease length of stay
SIGN (2006)	• To provide evidence based recommendations on the prevention, diagnosis, investigation, treatment and management of bronchiolitis in infants less than 12 months of age • To reduce the use of unnecessary therapies and investigations in infants with acute disease • To guide referral patterns from primary to secondary and tertiary care
Target Population	

AAP (2006)	Children 1 month to 2 years of age **Note**: The guideline does not apply to children with immunodeficiencies including human immunodeficiency virus (HIV), organ or bone marrow transplants, or congenital immunodeficiencies. Children with underlying respiratory illnesses such as chronic neonatal lung disease (CLD; also known as bronchopulmonary dysplasia) and those with significant congenital heart disease are excluded from the sections on management unless otherwise noted but are included in the discussion of prevention.
CCHMC (2006b)	These guidelines are intended for use in children: Age less than 12 completed months and presenting for the first time episode with bronchiolitis typical in presentation and clinical course ***These guidelines are <u>not</u> intended for use in children***: • With a history of cystic fibrosis (CF) • With a history of bronchopulmonary dysplasia (BPD) • With immunodeficiencies • Admitted to an intensive care unit • Requiring ventilator care • With other severe comorbid conditions complicating care
SIGN (2006)	Infants less than 12 months of age As infants with significant comorbidities have increased susceptibility to bronchiolitis beyond twelve months of age, the following specific groups were considered up to 24 months of age: • Those born prematurely ($\leq$37 weeks gestational age) • Infants with congenital heart disease (CHD) or underlying respiratory disease. **Note**: The guideline focuses on the clinically diagnosed condition of bronchiolitis in infants less than 12 months of age. This minimises any bias from reporting discrepancies associated with the diagnosis of bronchiolitis above this age. Bronchiolitis in immunodeficient infants or those with rare ("orphan") disease was not considered.
Intended Users	
AAP (2006)	Advanced Practice Nurses

	Emergency Medical Technicians/Paramedics Health Care Providers Nurses Physician Assistants Physicians Respiratory Care Practitioners
CCHMC (2006)	Advanced Practice Nurses Allied Health Personnel Health Care Providers Nurses Patients Physician Assistants Physicians Respiratory Care Practitioners
SIGN (2006)	Advanced Practice Nurses Allied Health Personnel Health Care Providers Nurses Patients Pharmacists Physicians Public Health Departments

TABLE 3: COMPARISON OF METHODOLOGY

Methods Used to Collect/Select the Evidence	
AAP (2006)	Hand-searches of Published Literature (Primary Sources) Hand-searches of Published Literature (Secondary Sources) Searches of Electronic Databases Evidence Review: • Management of bronchiolitis in infants and children. Summary. 2003 Jan. 6 p. AHRQ Evidence Report/Technology Assessment No. 69. Electronic copies: Available from the Agency for Healthcare Research and Quality Web site. *Described Process*: The American Academy of Pediatrics (AAP) and American Academy of Family Physicians (AAFP) partnered with the Agency for Healthcare Research and Quality (AHRQ) and the Research Triangle Institute (RTI) International-University of North Carolina Evidence-Based Practice Center (EPC) to develop an evidence report, which served as a major source of information for these practice guideline recommendations. Specific clinical questions addressed in the AHRQ evidence report were the (1) effectiveness of diagnostic tools for diagnosing bronchiolitis in infants and children, (2) efficacy of pharmaceutical therapies for treatment of bronchiolitis, (3) role of prophylaxis in prevention of bronchiolitis, and (4) cost-effectiveness of prophylaxis for management of bronchiolitis. EPC project staff searched Medline, the Cochrane Collaboration, and the Health Economics Database. Additional articles were identified by review of reference lists of relevant articles and ongoing studies recommended by a technical expert advisory group. To answer the question on diagnosis, both prospective studies and randomized, controlled trials (RCTs) were used. For questions related to treatment and prophylaxis in the AHRQ report, only RCTs were considered. For the cost-effectiveness of prophylaxis, studies that used economic analysis were reviewed. For all studies, key inclusion criteria included outcomes that were both clinically relevant and able to be abstracted. The investigators set a minimum sample size of 10; small case series and single case reports were excluded. Studies in languages other than English did not meet the admissibility criteria. Results of the literature review were presented in evidence tables and published in the final evidence report. An additional literature search of Medline and the Cochrane Database of Systematic Reviews was performed in July 2004 by using search terms submitted by the members of the Subcommittee on the Diagnosis and Management of Bronchiolitis. The methodologic quality of the research was appraised by an epidemiologist before

	consideration by the subcommittee. *Number of Source Documents*: Initially, 744 abstracts were identified for possible inclusion, of which 83 were retained for systematic review.
CCHMC (2006)	Searches of Electronic Databases *Described Process*: To select evidence for critical appraisal by the group, the Medline, EmBase, and the Cochrane databases were searched for dates of October 2001 through October 2004 to generate an unrefined, "combined evidence" database using a search strategy focused on answering clinical questions relevant to bronchiolitis and employing a combination of Boolean searching on human-indexed thesaurus terms (Medical Subject Heading [MeSH] headings using an OVID Medline interface) and "natural language" searching on words in the title, abstract, and indexing terms. The citations were reduced by eliminating duplicates, review articles, non-English articles, and adult articles. The resulting abstracts were reviewed by a methodologist to eliminate low quality and irrelevant citations. During the course of the guideline development and revision, additional clinical questions were generated and subjected to the search process, and some relevant review articles were identified. August 2001 was the last date for which literature was searched for the previous version of the guideline. The details of previous review strategies are not documented. However, all citations carried from an earlier version were reviewed for appropriateness to this revision. **May 2006 Review** A search using the above criteria was conducted for dates of November, 2004 through May, 2006. Thirty-one relevant articles were selected as potential future citations for the guideline. However, none of these references were determined to require changes to the 2005 version of the recommendations. *Number of Source Documents*: 238
SIGN (2006)	Searches of Electronic Databases *Described Process*: The evidence base for this guideline was synthesised in accordance with Scottish Intercollegiate Guidelines Network (SIGN) methodology. A systematic literature review was carried out using an explicit search strategy devised by the SIGN Information Officer in collaboration with members of the guideline development group. Literature searches were initially conducted in Medline, Embase, Cinahl and the Cochrane Library, using the year range 2000 to 2005. The main searches were supplemented by material identified by individual members of the development group.

	All selected papers were evaluated using standard methodological checklists. The Medline version of the main search strategies can be found on the SIGN website. *Number of Source Documents*: Not stated
Methods Used to Assess the Quality and Strength of the Evidence	
AAP (2006)	Expert Consensus Weighting According to a Rating Scheme (Scheme Given - Refer to Table 6)
CCHMC (2006)	Not stated (Scheme Given - Refer to Table 6)
SIGN (2006)	Weighting According to a Rating Scheme (Scheme Given - Refer to Table 6)
Methods Used to Analyze the Evidence	
AAP (2006)	Systematic Review with Evidence Tables *Described Process*: A team of abstractors reviewed and abstracted information on study methodology and results into a data abstraction form. The Study Director entered studies on treatment and prophylaxis into evidence tables. The Scientific Directors reviewed the evidence tables and independently assigned quality scores to each article. When they did not agree, they reviewed the article together and arrived at a consensus. Of the 61 articles that were scored for quality for Key Questions 2 and 3 the Scientific Directors had an initial 98 percent rate of agreement within 1 point. (See *Management of Bronchiolitis in Infants and Children: Summary* [AHRQ Evidence Report/Technology Assessment] listed in the "Availability of Companion Documents" field of this summary.) A trained abstractor completed a detailed data abstraction form. The Study Director used the forms and the original articles to generate summary evidence tables. The Scientific Directors performed quality control checks through review of the evidence tables against the original articles.
CCHMC (2006)	Review Review of Published Meta-Analyses
SIGN (2006)	Systematic Review with Evidence Tables *Described Process*: Once papers have been selected as potential

sources of evidence, the methodology used in each study is assessed to ensure its validity. The result of this assessment will affect the level of evidence allocated to the paper, which will in turn influence the grade of recommendation that it supports.

The methodological assessment is based on a number of key questions that focus on those aspects of the study design that research has shown to have a significant influence on the validity of the results reported and conclusions drawn. These key questions differ between study types, and a range of checklists is used to bring a degree of consistency to the assessment process. Scottish Intercollegiate Guidelines Network (SIGN) has based its assessments on the MERGE (Method for Evaluating Research and Guideline Evidence) checklists developed by the New South Wales Department of Health, which have been subjected to wide consultation and evaluation. These checklists were subjected to detailed evaluation and adaptation to meet SIGN's requirements for a balance between methodological rigour and practicality of use.

The assessment process inevitably involves a degree of subjective judgment. The extent to which a study meets a particular criterion (e.g., an acceptable level of loss to follow up) and, more importantly, the likely impact of this on the reported results from the study will depend on the clinical context. To minimise any potential bias resulting from this, each study must be evaluated independently by at least two group members. Any differences in assessment should then be discussed by the full group. Where differences cannot be resolved, an independent reviewer or an experienced member of SIGN Executive staff will arbitrate to reach an agreed quality assessment.

Evidence Tables

Evidence tables are compiled by SIGN executive staff based on the quality assessments of individual studies provided by guideline development group members. The tables summarise all the validated studies identified from the systematic literature review relating to each key question. They are presented in a standard format to make it easier to compare results across studies, and will present separately the evidence for each outcome measure used in the published studies. These evidence tables form an essential part of the guideline development record and ensure that the basis of the guideline development group's recommendations is transparent.

Additional details can be found in the companion document titled "SIGN 50: A Guideline Developers' Handbook." (Edinburgh [UK]: Scottish Intercollegiate Guidelines Network. [SIGN publication; no. 50]), available from the SIGN Web site.

Methods Used to Formulate the Recommendations

AAP (2006)	Expert Consensus - Refer to Table 6 for rating scheme. *Described Process*: To develop the clinical practice guideline on the diagnosis and management of bronchiolitis, the American Academy of Pediatrics (AAP) convened the Subcommittee on Diagnosis and Management of Bronchiolitis with the support of the American Academy of Family Physicians (AAFP), the American Thoracic Society, the American College of Chest Physicians, and the European Respiratory Society. The subcommittee was chaired by a primary care pediatrician with expertise in clinical pulmonology and included experts in the fields of general pediatrics, pulmonology, infectious disease, emergency medicine, epidemiology, and medical informatics. The committee partnered with the Agency for Healthcare Research and Quality and the RTI International-University of North Carolina Evidence-Based Practice Center to develop a comprehensive review of the evidence-based literature related to the diagnosis, management, and prevention of bronchiolitis. The resulting evidence report and other sources of data were used to formulate clinical practice guideline recommendations. The AAP Policy Statement "Classifying Recommendations for Clinical Practice Guidelines" was followed in designating levels of recommendation.
CCHMC (2006)	Expert Consensus *Described Process*: Recommendations have been formulated by a consensus process directed by best evidence, patient and family preference, and clinical expertise. During formulation of these recommendations, the team members have remained cognizant of controversies and disagreements over the management of these patients. They have tried to resolve controversial issues by consensus where possible and, when not possible, to offer optional approaches to care in the form of information that includes best supporting evidence of efficacy for alternative choices.
SIGN (2006)	Expert Consensus. Refer to Table 6 for Rating Scheme *Described Process*: **Synthesising the Evidence** Guideline recommendations are graded to differentiate between those based on strong evidence and those based on weak evidence. This judgment is made on the basis of an (objective) assessment of the design and quality of each study and a (perhaps more subjective) judgment on the consistency, clinical relevance and external validity of the whole body of evidence. The aim is to produce a recommendation that is evidence-based, but which is relevant to the way in which health care is delivered in Scotland and

	is therefore implementable. It is important to emphasise that the grading does not relate to the importance of the recommendation, but to the strength of the supporting evidence and, in particular, to the predictive power of the study designs from which that data was obtained. Thus, the grading assigned to a recommendation indicates to users the likelihood that, if that recommendation is implemented, the predicted outcome will be achieved. **Considered Judgment** It is rare for the evidence to show clearly and unambiguously what course of action should be recommended for any given question. Consequently, it is not always clear to those who were not involved in the decision making process how guideline developers were able to arrive at their recommendations, given the evidence they had to base them on. In order to address this problem, SIGN has introduced the concept of considered judgment. Under the heading of considered judgment, guideline development groups summarise their view of the total body of evidence covered by each evidence table. This summary view is expected to cover the following aspects: • Quantity, quality, and consistency of evidence • Generalisability of study findings • Directness of application to the target population for the guideline • Clinical impact (i.e., the extent of the impact on the target patient population, and the resources needed to treat them) • Implementability (i.e., how practical it would be for the NHS in Scotland to implement the recommendation) Guideline development groups are provided with a pro forma in which to record the main points from their considered judgment. Once they have considered these issues, the group is asked to summarise their view of the evidence and assign a level of evidence to it, before going on to derive a graded recommendation. Additional detail about SIGN's process for formulating guideline recommendations is provided in Section 6 of the companion document titled "SIGN 50: A Guideline Developers' Handbook." (Edinburgh [UK]: Scottish Intercollegiate Guidelines Network. [SIGN publication; no. 50], available from the SIGN Web site.
Outcomes	
AAP (2006)	• Effectiveness and relative effectiveness of appropriate diagnostic tools for diagnosing bronchiolitis in infants and children

	• Efficacy or effectiveness of pharmaceutical therapies for treating bronchiolitis among infant and children • Symptom improvement • Mortality and morbidity • Hospitalization rate • Incidence of respiratory syncytial virus infection • Length of hospitalization • Cost-effectiveness of prophylactic therapy for prevention of bronchiolitis among infants born from 32 through 35 weeks of estimated gestation age (EGA) and premature infants with comorbidities
CCHMC (2006)	• Clinical improvement • Hospitalization rates • Length of stay
SIGN (2006)	• Effectiveness of diagnostic interventions/tools • Effectiveness of therapeutic interventions • Cost effectiveness of prophylactic therapy • Symptom improvement and short term clinical benefits • Development of subsequent chronic respiratory symptoms • Hospitalization rate and length of hospital stay • Admission to paediatric intensive care unit (PICU) • Health care related infection rates
Financial Disclosures/Conflicts of Interest	
AAP (2006)	All panel members reviewed the American Academy of Pediatrics (AAP) Policy on Conflict of Interest and Voluntary Disclosure and were given an opportunity to declare any potential conflicts.
CCHMC (2006)	The guideline was developed without external funding. All Team Members and Clinical Effectiveness support staff listed have declared whether they have any conflict of interest and none were identified.
SIGN (2006)	Declarations of interests were made by all members of the guideline development group. Further details are available from the Scottish Intercollegiate Guidelines Network (SIGN) Executive.

TABLE 4: COMPARISON OF RECOMMENDATIONS FOR THE DIAGNOSIS AND TREATMENT OF PEDIATRIC BRONCHIOLITIS
PREVENTION/TRANSMISSION REDUCTION

AAP (2006)	**Recommendation 8a** Clinicians may administer palivizumab prophylaxis to selected infants and children with chronic lung disease (CLD) or a history of prematurity (less than 35 weeks' gestation) or with congenital heart disease **(recommendation: evidence level A)**. **Recommendation 8b** When given, prophylaxis with palivizumab should be given in 5 monthly doses, usually beginning in November or December, at a dose of 15 mg/kg per dose administered intramuscularly **(recommendation: evidence level C)**. **Recommendation 9a** Hand decontamination is the most important step in preventing nosocomial spread of respiratory syncytial virus (RSV). Hands should be decontaminated before and after direct contact with patients, after contact with inanimate objects in the direct vicinity of the patient, and after removing gloves **(strong recommendation: evidence level B)**. **Recommendation 9b** Alcohol-based rubs are preferred for hand decontamination. An alternative is hand-washing with antimicrobial soap **(recommendation: evidence level B)**. **Recommendation 9c** Clinicians should educate personnel and family members on hand sanitation **(recommendation: evidence level C)**. **Recommendation 10a** Infants should not be exposed to passive smoking **(strong recommendation: evidence level B)**. **Recommendation 10b** Breastfeeding is recommended to decrease a child's risk of having lower respiratory tract disease (LRTD) **(recommendation: evidence level C)**.
CCHMC (2006)	**<u>Prevention</u>** **General**

Infants less than three months of age, premature infants (<35 weeks gestation), and infants with chronic lung disease, congenital heart disease, or immune deficiency syndromes who are diagnosed with bronchiolitis may be at particular risk for hospitalization and significant morbidity *(Shay et al., 2001 [D]; Boyce et al., 2000 [D]; Joffe et al., "Rehospitalization," 1999 [D]; Church et al., 1984 [D]; Shay et al., 1999 [O])*. Prevention of hospitalization and significant morbidity is a high priority in the management of this lower respiratory tract infection.

Prevention Measures

1. It is recommended that measures to prevent acute bronchiolitis be reviewed with parents of newborns prior to discharge from the hospital and at follow-up visits in the first years of life. These specific measures include:
    - Eliminating exposure to environmental tobacco smoke *(Mahabee-Gittens, 2002 [O])*.
    - Limiting exposure to contagious settings and siblings (e.g., daycare centers)
    - An emphasis on handwashing in all settings
    - Preventive medical therapies such as palivizumab (Synagis®, MedImmune) may be considered for selected high-risk patients *("Palivizumab," 1998 [A]; Celedon et al., 1999 [C]; Aitken & Taylor, 1998 [C]; Wald, Guerra, & Byers, 1991 [C]).*
        - **Note**: A large, multicenter double-blind, randomized, controlled trial has shown that palivizumab (Synagis®, MedImmune) reduced the rates of hospitalization (not acute infection) for all infants studied, premature infants (<35 weeks) less than six months of age, and infants with bronchopulmonary dysplasia (BPD) by 55%, 78%, and 39% respectively. The use of palivizumab has not been shown to be cost-effective in children regardless of prematurity or the presence of congenital heart disease due to the high cost of the medication and persistently low mortality rates associated with respiratory syncytial virus (RSV)-bronchiolitis *("Palivizumab," 1998 [A]; Heikkinen et al., 2005 [C]; Wegner et al., 2004 [C]; Shay et al., 2001 [D]; Yount & Mahle, 2004 [Q]; Joffe et al., "Cost-effectiveness," 1999 [Q]).*
2. It is recommended, in patients with documented bronchiolitis, that masks covering the nose and eyes be worn and that contact isolation, including vigorous handwashing, be performed before and after entering the exam room *(Hall et al., 1981 [C]; Hall, 2001 [S]; Local Expert Consensus [E])*.

    Note 1: Viral transmission occurs by direct inoculation of contagious secretions from the hands or by large-particle

	aerosols into the eyes and nose, but rarely the mouth. **Note 2**: Nosocomial infection may place medically fragile infants and children at increased risk for morbidity and mortality upon exposure to the hospital environment *(Langley et al., 1997 [C])*. **Note 3**: Follow Respiratory/Contact **precautions** as described for bronchiolitis in the Cincinnati Children's Hospital Medical Center (CCHMC) Infection Control Manual (ICRM-735) *(Local Expert Consensus [E])*.
SIGN (2007)	**Social Factors** *Breastfeeding* **C** - Breast feeding reduces the risk of RSV-related hospitalisation and should be encouraged and supported. *Parental Smoking* **C** - Healthcare professionals should inform families that parental smoking is associated with increased risk of RSV-related hospitalisation. **<u>Limiting Disease Transmission</u>** **Ward-Based Strategies** **D** - Staff should decontaminate their hands *(with soap and water or alcohol gel)* before and after caring for patients with viral respiratory symptoms. **D** - Gloves and plastic aprons *(or gowns)* should be used for any direct contact with the patient or their immediate environment. **D** - Infected patients should be placed in single rooms. If adequate isolation facilities are unavailable, the allocation of patients into cohorts should be based on laboratory confirmation of infection in all inpatients less than two years of age with respiratory symptoms. **D** - Both service providers and staff should be aware of the risk that those with upper respiratory tract infections pose for high-risk infants. **D** - Local policies should restrict hospital visiting by those with symptoms of respiratory infections. **D** - There should be ongoing surveillance by control of infection staff

	to monitor compliance with infection control procedures. **<u>Prophylactic Therapies</u>** **Palivizumab** **GPP** - Routine use of palivizumab is not recommended **GPP** - Palivizumab may be considered for use, on a case by case basis, in infants less than 12 months old with: • Extreme prematurity • Acyanotic congenital heart disease • Congenital or acquired significant orphan lung diseases • Immune deficiency **GPP** - A local lead specialist should work with the appropriate clinical teams to identify those infants who may benefit from palivizumab.
DIAGNOSIS	
Physical Examination	
AAP (2006)	**Recommendation 1a** Clinicians should diagnose bronchiolitis and assess disease severity on the basis of history and physical examination. Clinicians should not routinely order laboratory and radiologic studies for diagnosis **(recommendation: evidence level B)**. **Recommendation 1b** Clinicians should assess risk factors for severe disease such as age less than 12 weeks, a history of prematurity, underlying cardiopulmonary disease, or immunodeficiency when making decisions about evaluation and management of children with bronchiolitis **(recommendation: evidence level B)**. The 2 goals in the history and physical examination of infants presenting with cough and/or wheeze, particularly in the winter season, are the differentiation of infants with probable bronchiolitis from those with other disorders and the estimation of the severity of illness. Most clinicians recognize bronchiolitis as a constellation of clinical symptoms and signs including a viral upper respiratory prodrome followed by increased respiratory effort and wheezing in children less than 2 years of age. Clinical signs and symptoms of bronchiolitis consist of rhinorrhea, cough, wheezing, tachypnea, and increased respiratory effort manifested as grunting, nasal flaring,

	and intercostal and/or subcostal retractions. Respiratory rate in otherwise healthy children changes considerably over the first year of life, decreasing from a mean of approximately 50 breaths per minute in term newborns to approximately 40 breaths per minute at 6 months of age and 30 breaths per minute at 12 months. Counting respiratory rate over the course of 1 minute may be more accurate than measurements extrapolated to 1 minute but observed for shorter periods. The absence of tachypnea correlates with the lack of lower respiratory tract infections (LRTIs) or pneumonia (viral or bacterial) in infants. The course of bronchiolitis is variable and dynamic, ranging from transient events such as apnea or mucus plugging to progressive respiratory distress from lower airway obstruction. Important issues to assess include the impact of respiratory symptoms on feeding and hydration and the response, if any, to therapy. The ability of the family to care for the child and return for further care should be assessed. History of underlying conditions such as prematurity, cardiac or pulmonary disease, immunodeficiency, or previous episodes of wheezing should be identified. The physical examination reflects the variability in the disease state and may require serial observations over time to fully assess the child's status. Upper airway obstruction may contribute to work of breathing. Nasal suctioning and positioning of the child may affect the assessment. Physical examination findings of importance include respiratory rate, increased work of breathing as evidenced by accessory muscle use or retractions, and auscultatory findings such as wheezes or crackles.
CCHMC (2006)	**<u>Assessment and Diagnosis</u>** **Clinical History and Physical Examination** It is recommended that the clinical history and physical examination be the basis for a diagnosis of bronchiolitis. The diagnosis of bronchiolitis and its severity is rooted in the clinician's interpretation of the constellation of characteristic findings and is not dependent on any specific clinical finding or diagnostic test *(Bordley et al., 2004 [M])*. Infants with acute bronchiolitis may present with a wide range of clinical symptoms and severity, from mild upper respiratory infections (URI) to impending respiratory failure. Diagnostic criteria for bronchiolitis include, but are not limited to, the following: • Preceding upper respiratory illness and/or rhinorrhea

	• Signs of respiratory illness which may include the following common upper respiratory infection symptoms:
	  • Wheezing
	  • Retractions
	  • Shortness of breath
	  • Low oxygen (O_2) saturation
	  • Tachypnea
	  • Color change
	  • Nasal flaring
	• Signs of dehydration
	• Exposure to persons with viral upper respiratory infection

SIGN (2007)	**Diagnostic Value of Clinical Characteristics** *Fever* **D** - The absence of fever should not preclude the diagnosis of acute bronchiolitis. **D** - In the presence of high fever *(axillary temperature ≥39°C)* careful evaluation for other causes should be undertaken before making a diagnosis. **GPP** - It is unusual for infants with bronchiolitis to appear "toxic". A "toxic" infant who is drowsy, lethargic or irritable, pale, mottled and tachycardic requires immediate treatment. Careful evaluation for other causes should be undertaken before making a diagnosis of bronchiolitis. *Respiratory Rate* **D** - Increased respiratory rate should arouse suspicion of lower respiratory tract infection, particularly bronchiolitis or pneumonia. **Summary of Diagnostic Characteristics** **D** - A diagnosis of acute bronchiolitis should be considered in an infant with nasal discharge and a wheezy cough, in the presence of fine inspiratory crackles and/or high pitched expiratory wheeze. Apnoea may be a presenting feature. **Seasonality** **D** - Healthcare professionals should take seasonality into account when considering the possible diagnosis of acute bronchiolitis. **Significant Comorbidities**

	Summary of Effect of Comorbidity **C** - Healthcare professionals should be aware of the increased need for hospital admission in infants born at less than 35 weeks gestation and in infants who have congenital heart disease or chronic lung disease of prematurity.
Laboratory and Radiologic Investigations	
AAP (2006)	**Recommendation 1a** Clinicians should diagnose bronchiolitis and assess disease severity on the basis of history and physical examination. Clinicians should not routinely order laboratory and radiologic studies for diagnosis **(recommendation: evidence level B)**. Pulse oximetry has been rapidly adopted into clinical assessment of children with bronchiolitis on the basis of data suggesting that it can reliably detect hypoxemia that is not suspected on physical examination. Few studies have assessed the effectiveness of pulse oximetry to predict clinical outcomes. Among inpatients, perceived need for supplemental oxygen that is based on pulse oximetry has been associated with higher risk of prolonged hospitalization, intensive care unit (ICU) admission, and mechanical ventilation. Among outpatients, available evidence differs on whether mild reductions in pulse oximetry (less than 95% on room air) predict progression of disease or need for a return visit for care. Radiography may be useful when the hospitalized child does not improve at the expected rate, if the severity of disease requires further evaluation, or if another diagnosis is suspected. Although many infants with bronchiolitis have abnormalities that show on chest radiographs, data are insufficient to demonstrate that chest radiograph abnormalities correlate well with disease severity. Current evidence does not support routine radiography in children with bronchiolitis. The clinical utility of diagnostic testing in infants with suspected bronchiolitis is not well supported by evidence. The occurrence of serious bacterial infections (SBIs; e.g., urinary tract infections [UTIs], sepsis, meningitis) is very low. The use of complete blood counts has not been shown to be useful in either diagnosing bronchiolitis or guiding its therapy. Virologic tests for RSV, if obtained during peak RSV season, demonstrate a high predictive value. However, the knowledge gained from such testing rarely alters management decisions or outcomes for the vast majority of children with clinically diagnosed bronchiolitis. Virologic testing may be useful when cohorting of

	patients is feasible.
CCHMC (2006)	**Laboratory and Radiologic Studies** It is recommended that routine diagnostic studies (RSV swab, chest x-rays, cultures, capillary or arterial blood gases, rapid influenza or other rapid viral studies) **not** be performed to determine viral infection status or to rule out serious bacterial infections. Such studies are not generally helpful and may result in increased rates of unnecessary admission, further testing, and unnecessary therapies *(Bordley et al., 2004 [M]; Swingler, Hussey, & Zwarenstein, 1998 [A]; El-Radhi, Barry, & Patel, 1999 [C]; Kuppermann et al., 1997 [C]; Liebelt, Qi, & Harvey, 1999 [D]; Antonow et al., 1998 [D]; Schwartz, 1995 [S]; Chiocca, 1994 [S]; Lugo & Nahata, 1993 [S]; Stark & Busse, 1991 [S])*. **Note 1**: Chest x rays may be obtained as clinically indicated when the diagnosis of bronchiolitis is not clear *(Swingler, Hussey, & Zwarenstein, 1998 [A]; El-Radhi, Barry, & Patel, 1999 [C])*. **Note 2**: Capillary or arterial blood gases and pulse oximetry may be obtained as clinically indicated for individual patients *(Local Expert Consensus [E])*. **Note 3**: In selected very young infants, establishing a source through rapid viral testing may prevent unnecessary additional workup *(Bordley et al., 2004 [M])*.
SIGN (2007)	**<u>Investigations</u>** *Oxygen Saturation* **C** - Pulse oximetry should be performed in every child who attends hospital with acute bronchiolitis. **GPP**: • Infants with oxygen saturation $\leq$ 92% require inpatient care. • Decision making around hospitalisation of infants with oxygen saturations between 92% and 94% should be supported by detailed clinical assessment, consideration of the phase of the illness and take into account social and geographical factors • Infants with oxygen saturations >94% in room air may be considered for discharge. *Blood Gases*

	GPP - Blood gas analysis (capillary or arterial) is not usually indicated in acute bronchiolitis. It may have a role in the assessment of infants with severe respiratory distress of who are tiring and may be entering respiratory failure. Knowledge of arterialised carbon dioxide values may guide referral to high dependency or intensive care. *Chest X-ray* **C** - Chest X-ray should not be performed in infants with typical acute bronchiolitis. **GPP** - Chest X-ray should be considered in those infants where there is diagnostic uncertainty or an atypical disease course. *Virological Testing* **D** - Unless adequate isolation facilities are available, rapid testing for RSV is recommended in infants who require admission to hospital with acute bronchiolitis, in order to guide cohort arrangements. *Bacteriological Testing* **C** - Routine bacteriological testing *(of blood and urine)* is not indicated in infants with typical acute bronchiolitis. Bacteriological testing of urine should be considered in febrile infants less than 60 days old. *Haematology* **D** - Full blood count is not indicated in assessment and management of infants with typical acute bronchiolitis. *Biochemistry* **D** - Measurement of urea and electrolytes is not indicated in the routine assessment and management of infants with typical acute bronchiolitis but should be considered in those with severe disease.
TREATMENT	
Pharmacologic Therapy	
AAP (2006)	**Recommendation 2a** Bronchodilators should not be used routinely in the management of bronchiolitis **(recommendation: evidence level B)**.

Recommendation 2b

A carefully monitored trial of alpha-adrenergic or beta-adrenergic medication is an option. Inhaled bronchodilators should be continued only if there is a documented positive clinical response to the trial using an objective means of evaluation **(option: evidence level B)**.

Although there is no evidence from randomized controlled trials (RCTs) to justify routine use of bronchodilators, clinical experience suggests that, in selected infants, there is an improvement in the clinical condition after bronchodilator administration. It may be reasonable to administer a nebulized bronchodilator and evaluate clinical response. Individuals and institutions should assess the patient and document pretherapy and posttherapy changes using an objective means of evaluation. Some of the documentation tools that have been used can be found in articles by Alario et al, Bierman and Pierson, Gadomski et al, Lowell et al, Wainwright et al, Schuh et al, and Gorelick et al. In addition, a documentation tool has been developed by Cincinnati Children's Hospital (Cincinnati, OH).

Extrapolation from the studies discussed above suggests that epinephrine may be the preferred bronchodilator for this trial in the emergency department and in hospitalized patients. In the event that there is documented clinical improvement, there is justification for continuing the nebulized bronchodilator treatments. In the absence of a clinical response, the treatment should not be continued.

Because of a lack of studies, short duration of action, and potential adverse effects, epinephrine is usually not used in the home setting. Therefore, it would be more appropriate that a bronchodilator trial in the office or clinic setting use albuterol/salbutamol rather than racemic epinephrine. Parameters to measure its effectiveness include improvements in wheezing, respiratory rate, respiratory effort, and oxygen saturation.

Anticholinergic agents such as ipratropium have not been shown to alter the course of viral bronchiolitis. Although a minority of individual patients may show a positive clinical response to anticholinergic agents, studies have shown that the groups as a whole showed no significant improvement. At this point there is no justification for using anticholinergic agents, either alone or in combination with beta adrenergic agents, for viral bronchiolitis.

Recommendation 3

Corticosteroid medications should not be used routinely in the management of bronchiolitis **(recommendation: evidence level B)**.

	Recommendation 4 Ribavirin should not be used routinely in children with bronchiolitis **(recommendation: evidence level B)**. Specific antiviral therapy for RSV bronchiolitis remains controversial because of the marginal benefit, if any, for most patients. In addition, cumbersome delivery requirements, potential health risks for caregivers, and high cost serve as disincentives for use in the majority of patients. Nevertheless, ribavirin may be considered for use in highly selected situations involving documented RSV bronchiolitis with severe disease or in those who are at risk for severe disease (e.g., immunocompromised and/or hemodynamically significant cardiopulmonary disease). **Recommendation 5** Antibacterial medications should be used only in children with bronchiolitis who have specific indications of the coexistence of a bacterial infection. When present, bacterial infection should be treated in the same manner as in the absence of bronchiolitis **(recommendation: evidence level B)**.
CCHMC (2006)	**Medications and Oxygen** • It is recommended that scheduled or serial albuterol aerosol therapies **not** be **routinely** used *(Kellner et al., 2005 [M]; Flores & Horwitz, 1997 [M]; Kellner et al., 1996 [M]; Goh et al., 1997 [A]; Dobson et al., 1998 [B]; Chowdhury et al., 1995 [B]; Lugo, Salyer, & Dean, 1998 [C]; Lenney & Milner, 1978 [D]).* **Note 1**: Although in some cases bronchiolitis may be a prelude to asthma *(Martinez et al., 1995 [C]; Stark & Busse, 1991 [S])*, in the majority of cases the use of inhalation therapies and other treatments effective for treating the bronchospasm characteristic in asthma will not be efficacious for treating the airway edema typical of bronchiolitis *(Hall, 2001 [S]; Klassen, 1997 [S])*. **Note 2**: Two meta-analyses of randomized, controlled trials have not shown dramatic effects on clinical scores or hospitalization rates from therapy with nebulized albuterol in children with bronchiolitis *(Flores & Horwitz, 1997 [M]; Kellner et al., 1996 [M])*. **Note 3**: Deterioration and desaturation has been associated with inhalation therapies *(Flores & Horwitz, 1997 [M]; Ho et al., 1991 [B])*. • It is recommended that a single administration trial inhalation

using epinephrine or albuterol may be considered as an option, particularly when there is a family history for allergy, asthma, or atopy *(Hartling et al., 2003 [M]; Klassen, 1997 [S])*.

Note 1: Nebulized racemic epinephrine was shown to result in better improvement in pulmonary physiology and clinical scores compared with albuterol or placebo in several studies and one systematic review. These effects predominated in mildly ill children and were transient (30 to 60 minutes) in duration *(Hartling et al., 2003 [M]; Wainwright et al., 2003 [A]; Numa, Williams, & Dakin, 2001 [O])*.

Note 2: See Respiratory Care Therapy section regarding the **importance of suctioning** before any inhalation therapy.

Note 3: The expected disposition of a patient may influence the choice of beta-agonist when a single administration trial is given. There is a lack of research regarding the appropriateness of routine epinephrine use outside the acute care setting *(Local Expert Consensus [E])*.

- It is recommended that inhalation therapy **not** be repeated nor continued if there is no improvement in clinical appearance between 15 to 30 minutes after a trial inhalation therapy *(Klassen, 1997 [S]; Bausch & Lomb Pharmaceuticals, 1999 [O])*.

  Note: In order to determine appropriateness of repeated therapy, use the Bronchiolitis Respiratory Sheet to record pre- and post-clinical score *(Conway et al., 2004 [C])*.

- It is recommended that antibiotics not be used in the absence of an identified bacterial focus.

  Note 1: The incidence of serious bacterial illness (SBI) has been reported to be less than 2% in bronchiolitis patients 60 days of age or younger *(Friis et al., 1984 [B]; Kuppermann et al., 1997 [C]; Purcell & Fergie, 2004 [D]; Purcell & Fergie, 2002 [D]; Liebelt, Qi, & Harvey, 1999 [D]; Antonow et al., 1998 [D])*. See the National Guideline Clearinghouse (NGC) summaries of the following CCHMC Evidence Based Clinical Practice Guidelines Evidence Based Clinical Practice Guideline for Fever of Uncertain Source in Infants 60 Days of Age or Less or Evidence Based Clinical Practice Guideline for Fever of Uncertain Source in Children 2 to 36 Months of Age, Evidence Based Clinical Practice Guideline for Medical Management of Acute Otitis Media in Children 2 Months to 13 Years of Age, and Evidence-based Care Guideline for Medical Management of First Urinary Tract Infection in Children 12 Years of Age or Less.

  Note 2: In almost 75% of patients with RSV infections, the

	virus may be isolated from the middle ear *(Heikkinen, Thint, & Chonmaitree, 1999 [C]; Andrade et al., 1998 [C]; Pitkaranta et al., 1998 [C])*. In patients with RSV and otitis media, a bacterial pathogen has been isolated in 25 out of 26 *(Andrade et al., 1998 [C])* and one out of eight *(Pitkaranta et al., 1998 [C])* middle ear fluid specimens after tympanocentesis. **Note 3**: Antibiotics have little, if any, effect on outcomes from otitis media *(Glasziou et al., 2005 [M]; Marcy et al., 2001 [M]; Del Mar, Glasziou, & Hayem, 1997 [M]; Rosenfeld et al., 1994 [M])*. • It is recommended that antihistamines, oral decongestants, and nasal vasoconstrictors **not** be used for routine therapy. **Note 1**: There is no evidence to date for efficacy of these medications in reduction of cough or congestion in infants with upper and lower respiratory tract infections *(Clemens et al., 1997 [B]; Hutton et al., 1991 [B]; "Use of codeine," 1997 [S]; Gadomski & Horton, 1992 [O])*. **Note 2**: Some components of these medications have been shown to be harmful to humans *(Kernan et al., 2000 [D])*. • It is recommended that steroid therapy **not** be given (as inhalations, intravenously, orally, or intramuscularly) *(King et al., 2004 [M]; Garrison et al., 2000 [M])*. **Note**: One well-conducted systematic review found a reduction in length of stay of 0.43 days (95% confidence interval [CI] 0.8 to 0.05) with steroid therapy for bronchiolitis *(Garrison et al., 2000 [M])*. However, when only the more methodologically rigorous studies with more specific definitions of bronchiolitis were analyzed in this meta-analysis, there was no significant effect of steroids on clinical status or length of stay.
SIGN (2006)	**<u>Treatment</u>** **Antivirals** **B** - Nebulised ribavirin is not recommended for treatment of acute bronchiolitis in infants. **Antibiotics** **GPP** - Antibiotic therapy is not recommended for treatment of acute bronchiolitis in infants.

	Inhaled Bronchodilators *Beta 2 Agonists* **B** - Inhaled beta 2 agonist bronchodilators are not recommended for the treatment of acute bronchiolitis in infants. *Anticholinergics* **GPP** - Nebulised ipratropium is not recommended for the treatment of acute bronchiolitis in infants. **Nebulised Epinephrine** **A** - Nebulised epinephrine is not recommended for the treatment of acute bronchiolitis in infants. **Anti-Inflammatories** **A** - Inhaled corticosteroids are not recommended for the treatment of acute bronchiolitis in infants. **A** - Oral systemic corticosteroids are not recommended for the treatment of acute bronchiolitis in infants.
Non-Pharmacological Therapy	
AAP (2006)	**Recommendation 6a** Clinicians should assess hydration and ability to take fluids orally **(strong recommendation: evidence level X)**. *Intravenous Fluids* Infants with mild respiratory distress may require only observation, particularly if feeding remains unaffected. When the respiratory rate exceeds 60 to 70 breaths per minute, feeding may be compromised, particularly if nasal secretions are copious. Infants with respiratory difficulty may develop nasal flaring, increased intercostal or sternal retractions, and prolonged expiratory wheezing and be at increased risk of aspiration of food into the lungs. Children who have difficulty feeding safely because of respiratory distress should be given intravenous fluids. The possibility of fluid retention related to production of antidiuretic hormone has been reported in patients with bronchiolitis. Clinicians should adjust fluid management accordingly. **Recommendation 6b**

	Chest physiotherapy should not be used routinely in the management of bronchiolitis **(recommendation: evidence level B)**. *Airway Clearance* No clinical benefit was found using vibration and percussion techniques. Suctioning of the nares may provide temporary relief of nasal congestion. There is no evidence to support routine "deep" suctioning of the lower pharynx or larynx. **Recommendation 7a** Supplemental oxygen is indicated if oxyhemoglobin saturation (SpO_2) falls persistently below 90% in previously healthy infants. If the SpO_2 does persistently fall below 90%, adequate supplemental oxygen should be used to maintain SpO_2 at or above 90%. Oxygen may be discontinued if SpO_2 is at or above 90% and the infant is feeding well and has minimal respiratory distress **(option: evidence level D)**. **Recommendation 7b** As the child's clinical course improves, continuous measurement of SpO_2 is not routinely needed **(option: evidence level D)**. **Recommendation 7c** Infants with a known history of hemodynamically significant heart or lung disease and premature infants require close monitoring as the oxygen is being weaned **(strong recommendation: evidence level B)**.
CCHMC (2006)	**<u>Management</u>** **General** The basic management of typical bronchiolitis is anchored in the provision of therapies that assures that the patient is clinically stable, well oxygenated, and well hydrated. The main benefits of hospitalization of infants with acute bronchiolitis are: • The careful monitoring of clinical status, • Maintenance of a patent airway (through positioning, suctioning, and mucus clearance), • Maintenance of adequate hydration, and • Parental education *(Klassen 1997 [S], Lugo 1993 [S], Panitch 1993 [S], Nicolai 1990*

[S], Local Expert Consensus [E]).

Medications and Oxygen

It is recommended to consider starting supplemental oxygen when the saturation is **consistently** less than 91% and consider weaning oxygen when **consistently** higher than 94% *(National Institutes of Health (NIH), 1997 [E]; Local Expert Consensus [E])*.

Oxygen therapy is frequently required in the treatment of bronchiolitis. See Monitoring section below for recommendation regarding oxygen saturation monitoring to maintain blood oxygen levels within a normal range. This range is variable in definition and patient-specific.

Respiratory Care Therapy

It is recommended the infant be **suctioned**, when clinically indicated:

- Before feedings
- As needed (PRN)
- Prior to each inhalation therapy

(Local Expert Consensus [E])

In order to appropriately measure improvement in clinical status due to the therapeutic effects of the medication, the following reasons for suctioning are considered:

- Suctioning itself may improve respiratory status such that inhalation therapy is not necessary. Thus, it is important to document the pre-and post-suction clinical score prior to treatment.
- Suctioning may improve the delivery of the inhalation treatment.

(Local Expert Consensus [E]).

Note: Normal saline nose drops may be used prior to suctioning (Local Expert Consensus [E]).

It is recommended that other routine respiratory care therapies **not** be used, as they have not been found to be helpful. These include:

- Chest physiotherapy (CPT) *(Perrotta, Ortiz, & Roque, 2005 [M])*
- Cool mist therapy *(Gibson, 1974 [S])*
- Aerosol therapy with saline *(Gadomski et al., 1994 [A];*

	Chowdhury et al., 1995 [B]; Ho et al., 1991 [B]). **Monitoring** It is recommended that scheduled spot checks of pulse oximetry be utilized in infants with bronchiolitis (Local Expert Consensus [E]). **Note 1**: Continuous oximetry measurement has been associated with increased length of stay of 1.6 days (95% CI, 1.1 to 2.0) on average *(Schroeder et al., 2004 [D])*. **Note 2**: Wide variability has been demonstrated in the manner in which clinicians use and interpret pulse oximetry readings in children with bronchiolitis. This variability has been shown to be associated with increased preferences for hospital admission and increased length of stay for children admitted with bronchiolitis *(Schroeder et al., 2004 [D]; Mallory et al., 2003 [O])*. **Note 3**: In a prospective study of healthy, term infants, transient oxygen desaturation episodes were documented and were determined to be representative of normal breathing and oxygenation behavior. This study excluded any decreases in oxygen saturation related to the infants' movement which would interfere with measurement *(Hunt et al., 1999 [C])*.
SIGN (2006)	**Hospital Based Supplementary Therapies** *Physiotherapy* **A** - Chest physiotherapy using vibration and percussion is not recommended in infants hospitalised with acute bronchiolitis who are not admitted to intensive care. *Nasal Suction* **D** - Nasal suction should be used to clear secretions in infants hospitalised with acute bronchiolitis who exhibit respiratory distress due to nasal blockage. *Maintaining Fluid Balance/Hydration* **D** - Nasogastric feeding should be considered in infants with acute bronchiolitis who cannot maintain oral intake or hydration. *Oxygen* **D** - Infants with oxygen saturation levels $\leq$92% or who have severe

	respiratory distress or cyanosis should receive supplemental oxygen by nasal cannulae or facemask. *Continuous Positive Airway Pressure and Negative Pressure Ventilation* **GPP** - Early discussion with a paediatric intensive care unit and introduction of respiratory support should be considered in all patients with severe respiratory distress or apnoeas.
Hospital Discharge Criteria	
AAP (2006)	No recommendations offered
CCHMC (2006)	**<u>Discharge Criteria</u>** It is recommended to begin discharge planning on admission (Local Expert Consensus [E]). Discharge criteria are: **Respiratory Status** • Respirations less than 70 per minute and no clinical evidence of increased work of breathing • Parent can clear the infant's airway using bulb suctioning. • Patient is either on room air or on stable oxygen therapy that is at a level considered consistent with being able to effectively continue the therapy at home. **Nutritional Status** • The patient is on oral feedings at a level to prevent dehydration. **Social** • Home resources are adequate to support the use of any necessary home therapies. • Parent or guardian is confident they can provide care at home. • Family education complete **Follow Up** • When indicated, home care and durable medical supply (DMS) agencies have been notified and arrangements for visits finalized. • Primary care provider identified, notified, and agrees with discharge decision • Follow-up appointments have been scheduled.

SIGN (2006)	**Duration of Symptoms Following Acute Bronchiolitis** **B** - Parents and carers should be informed that, from the onset of acute bronchiolitis, around half of infants without comorbidity are asymptomatic by two weeks but that a small proportion will still have symptoms after four weeks. **Hospital Discharge Criteria** *Oxygen Saturation* **GPP** - Infants who have required supplemental oxygen therapy should have oxygen saturation monitoring for a period of 8 to 12 hours after therapy is discontinued (including a period of sleep) to ensure clinical stability before being considered for discharge. **GPP** - Infants with oxygen saturations >94% in room air may be considered for discharge. *Feeding* **GPP** - Hospitalized infants should not be discharged until they can maintain an adequate daily oral intake (>75% of usual intake).
Education	
AAP (2006)	**Recommendation 9c** Clinicians should educate personnel and family members on hand sanitation **(recommendation: evidence level C)**. **Recommendation 11** Clinicians should inquire about use of complementary and alternative medicine (CAM) **(option: evidence level D)**.
CCHMC (2006)	**Education** It is recommended that the family be educated on the following topics regarding the care of a child with bronchiolitis: • Basic pathophysiology and expected clinical course of bronchiolitis **Note**: The median duration of illness for children <24 months with bronchiolitis is 12 days; after 21 days approximately 18% will remain ill, and after 28 days 9% will remain ill *(Swingler, Hussey, & Zwarenstein, 2000 [C])*.

	• Proper techniques for suctioning the nose and making breathing easier *(Local Expert Consensus [E])* • To call their primary care provider when the following signs of worsening clinical status are observed *(Local Expert Consensus [E])*. a. increasing respiratory rate and/or work of breathing as indicated by accessory muscle use b. inability to maintain adequate hydration c. worsening general appearance It is recommended that the family be educated on the following topics regarding prevention of respiratory infection in infants: • Eliminating exposure to environmental tobacco smoke *(Mahabee-Gittens, 2002 [O])* • Limiting exposure to contagious settings and siblings (e.g., daycare centers) *(Celedon et al., 1999 [C])* • An emphasis on handwashing in all settings *(Hall et al., 1981 [C])*
SIGN (2006)	**<u>Limiting Disease Transmission</u>** **Education** **D** - Healthcare professionals should be educated about the epidemiology and control of RSV where appropriate. **<u>Information for Parents and Carers</u>** **Information Provision** **D** - Parents and carers should receive information about their child's condition, its treatment and prognosis.
Follow-Up Care and Referral	
AAP (2006)	No recommendations offered.
CCHMC (2006)	**Education** It is recommended that the family be educated on the following regarding the care of a child with bronchiolitis: • To call their primary care provider when the following signs of worsening clinical status are observed *(Local Expert Consensus [E])*. a. Increasing respiratory rate and/or work of breathing as

	indicated by accessory muscle use b. Inability to maintain adequate hydration c. Worsening general appearance

SIGN (2006)	**Referral**
	
	GPP - most infants with acute bronchiolitis will have mild disease and can be managed at home with primary care support. Parents/care givers should be given information on how to recognise any deterioration in their infant's condition and asked to bring them back for reassessment should this occur.
	
	GPP - Any of the following indications should prompt hospital referral/acute paediatric assessment in an infant with acute bronchiolitis or suspected acute bronchiolitis:
	
	• Poor feeding (<50% of usual fluid intake in preceding 24 hours)
	• Lethargy
	• History of apnoea
	• Respiratory rate >70/min
	• Presence of nasal flaring and/or grunting
	• Severe chest wall recession
	• Cyanosis
	• Oxygen saturation ≤94%
	• Uncertainty regarding diagnosis
	
	Clinicians assessing the need to refer (or review in primary care) should also take account of whether the illness is at an early (and perhaps worsening) state, or at a later (improving) stage.
	
	• **GPP** The threshold for hospital referral should be lowered in patients with significant comorbidities, those less than three months of age or infants born at less than 35 weeks gestation. Geographical factors/transport difficulties and social factors should also be taken into consideration.
	• **GPP** Indications for high dependency/intensive care unit consultation include:
	  • Failure to maintain oxygen saturations of greater than 92% with increasing oxygen therapy
	  • Recurrent apnoea

SELECTED SUPPORTING REFERENCES
NOTE FROM NGC: BOLDED REFERENCES ARE CITED IN MORE THAN ONE GUIDELINE. REFER TO THE ORIGINAL GUIDELINE DOCUMENTS FOR A

COMPLETE LISTING OF SUPPORTING REFERENCES	
AAP (2006)	Agency for Healthcare Research and Quality. *Management of Bronchiolitis in Infants and Children.* Evidence Report/Technology Assessment No. 69. Rockville, MD: Agency for Healthcare Research and Quality; 2003. AHRQ Publication No. 03-E014 American Academy of Pediatrics, Steering Committee on Quality Improvement and Management. Classifying recommendations for clinical practice guidelines. *Pediatrics.* 2004;114:874-7 [Abstract/Free Full Text] Ashton R, Connolly K. The relation of respiration rate and heart rate to sleep states in the human newborn. *Dev Med Child Neurol.* 1971;13:180 [Medline] Berman S, Simoes EA, Lanata C. Respiratory rate and pneumonia in infancy. *Arch Dis Child.* 1991;66:81-4 [Medline] Bierman CW, Pierson WE. The pharmacological management of status asthmaticus in children. *Pediatrics.* 1974;54:245-7 [Abstract/Free Full Text] **Bordley WC, Viswanathan M, King VJ, et al. Diagnosis and testing in bronchiolitis: a systematic review. *Arch Pediatr Adolesc Med.* 2004;158:119-26** [Abstract/Free Full Text] Bradley JS, Conner JD, Compagiannis LS, Eiger LL. Exposure of health care workers to ribavirin during therapy for respiratory syncytial virus infections. *Antimicrob Agents Chemother.* 1990;34:668-70 [Abstract/Free Full Text] Brooks AM, McBride JT, McConnochie KM, Aviram M, Long C, Hall CB. Predicting deterioration in previously healthy infants hospitalized with respiratory syncytial virus infection. *Pediatrics.* 1999;104:463-7 [Abstract/Free Full Text] **Chowdhury D, al Howasi M, Khalil M, al-Frayh AS, Chowdhury S, Ramia S. The role of bronchodilators in the management of bronchiolitis: a clinical trial. *Ann Trop Paediatr.* 1995;15:77-84** www.cincinnatichildrens.org/NR/rdonlyres/B3EC347E-65AC-490A-BC4C-55C3AF4B76D5/0/BronchRS.pdf. Accessed June 21, 2006 Feldstein TJ, Swegarden JL, Atwood GF, Peterson CD. Ribavirin therapy: implementation of hospital guidelines and effect on usage and cost of therapy. *Pediatrics.* 1995;96:14-7 [Abstract/Free Full Text] Gadomski AM, Lichtenstein R, Horton L, King J, Keane V, Permutt T. Efficacy of albuterol in the management of bronchiolitis. *Pediatrics.*

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TABLE 5: BENEFITS AND HARMS	
Benefits	
AAP (2006)	Improved diagnosis, treatment, management and prevention of bronchiolitis in infants and children
CCHMC (2006)	• Decreased use of unnecessary diagnostic studies • Decreased use of medications and respiratory therapy without observed improvement • Improved rate of appropriate admission • Decreased rate of nosocomial infection • Improved use of appropriate monitoring activities

	• Decreased length of stay
SIGN (2006)	Improved prevention, diagnosis, investigation, treatment and management of bronchiolitis in infants 12 months or younger
Harms	
AAP (2006)	Not stated
CCHMC (2006)	Wide variability has been demonstrated in the manner in which clinicians use and interpret pulse oximetry readings in children with bronchiolitis. This guideline's recommendations seek to reduce this variability in order to limit the associated increased preferences for hospital admission and increased length of stay for children admitted with bronchiolitis, but with the trade-off of not observing or managing transient hypoxia.
SIGN (2006)	Not stated

TABLE 6: EVIDENCE RATING SCHEMES AND REFERENCES	
AAP (2006)	Evidence Profile 1a: Diagnosis • Aggregate evidence quality: B; diagnostic studies with minor limitations and observational studies with consistent findings • Benefit: cost saving, limitation of radiation and blood tests • Harm: risk of misdiagnosis • Benefits-harms assessment: preponderance of benefit over harm • Policy level: recommendation Evidence Profile 1b: Risk Factors • Aggregate evidence quality: B; observational studies with consistent findings • Benefit: improved care of patients with risk factors for severe disease • Harm: increased costs, increased radiation and blood testing • Benefits-harms assessment: preponderance of benefit over harm • Policy level: recommendation

Evidence Profile 2a: Routine Use of Bronchodilators

- Aggregate evidence quality: B; randomized controlled trials (RCTs) with limitations
- Benefit: short-term improvement in clinical symptoms
- Harm: adverse effects, cost of medications, cost to administer
- Benefits-harms assessment: preponderance of harm over benefit
- Policy level: recommendation

Evidence Profile 2b: Trial of Bronchodilators

- Aggregate evidence quality: B; RCTs with limitations
- Benefit: some patients with significant symptomatic improvement
- Harm: adverse effects, cost of medications, cost to administer
- Benefits-harms assessment: preponderance of benefit over harm in select patients
- Policy level: option

Evidence Profile 3: Corticosteroids

- Aggregate evidence quality: B; randomized clinical trials with limitations
- Benefit: possibility that corticosteroid may be of some benefit
- Harm: exposure to unnecessary medication
- Benefits-harms assessment: preponderance of harm over benefit
- Policy level: recommendation

Evidence Profile 4: Ribavirin

- Aggregate evidence quality: B; RCTs with limitations and observational studies
- Benefit: some improvement in outcome
- Harm: cost, delivery method, potential health risks to caregivers
- Benefits-harms assessment: preponderance of harm over benefit
- Policy level: recommendation

Evidence Profile 5: Antibacterial Therapy

- Aggregate evidence quality: B; RCTs and observational studies with consistent results
- Benefit: appropriate treatment of bacterial infections, decreased exposure to unnecessary medications and their adverse effects when a bacterial infection is not present, decreased risk of development of resistant bacteria
- Harm: potential to not treat patient with bacterial infection
- Benefits-harms assessment: preponderance of benefit over

	harm • Policy level: recommendation Evidence Profile 6a: Fluids • Aggregate evidence quality: evidence level X; validating studies cannot be performed • Benefit: prevention of dehydration • Harm: overhydration, especially if syndrome of inappropriate secretion of antidiuretic hormone (SIADH) is present • Benefits-harms assessment: clear preponderance of benefit over harm • Policy level: strong recommendation Evidence Profile 6b: Chest Physiotherapy • Aggregate evidence quality: B; RCTs with limitations • Benefit: clearance of secretions, prevention of atelectasis • Harm: stress to infant during procedure, cost of administering chest physiotherapy • Benefits-harms assessment: preponderance of harm over benefit • Policy level: recommendation Evidence Profile 7a: Supplemental Oxygen • Aggregate evidence quality: D; expert opinion and reasoning from first principles • Benefit: use of supplemental oxygen only when beneficial, shorter hospitalization • Harm: inadequate oxygenation • Benefits-harms assessment: some benefit over harm • Policy level: option Evidence Profile 7b: Measurement of SpO_2 • Aggregate evidence quality: D; expert opinion • Benefit: shorter hospitalization • Harm: inadequate oxygenation between measurements • Benefits-harms assessment: some benefit over harm • Policy level: option Evidence Profile 7c: High-Risk Infants • Aggregate evidence quality: B; observational studies with consistent findings • Benefit: improved care of high-risk infants • Harm: longer hospitalization, use of oxygen when not beneficial • Benefits-harms assessment: preponderance of benefit over harm

	• Policy level: Strong recommendation Evidence Profile 8a: Palivizumab Prophylaxis • Aggregate evidence quality: A; RCTs • Benefit: prevention of morbidity and mortality in high-risk infants • Harm: cost • Benefits-harms assessment: preponderance of benefit over harm • Policy level: recommendation Evidence Profile 8b: Five-Dose Regimen • Aggregate evidence quality: C; observational studies and expert opinion • Benefit: decreased cost resulting from using minimal number of needed doses • Harm: risk of illness from respiratory syncytial virus (RSV) outside the usual season • Benefits-harms assessment: preponderance of benefit over harm • Policy level: recommendation Evidence Profile 9a: Hand Decontamination • Aggregate evidence quality: B; observational studies with consistent findings • Benefit: decreased spread of infection • Harm: time • Benefits-harms assessment: strong preponderance of benefit over harm • Policy level: strong recommendation Evidence Profile 9b: Alcohol-Based Rubs • Aggregate evidence quality: B; observational studies with consistent findings • Benefit: decreased spread of infection • Harm: irritative effect of alcohol-based rubs • Benefits-harms assessment: preponderance of benefit over harm • Policy level: recommendation Evidence Profile 9c: Education • Aggregate evidence quality: C; observational studies • Benefit: decreased spread of infection • Harm: time, cost of gloves and gowns if used, barriers to parental contact with patient

- Benefits-harms assessment: preponderance of benefit over harm
- Policy level: recommendation

Evidence Profile 10a: Secondhand Smoke

- Aggregate evidence quality: B; observational studies with consistent findings
- Benefit: decreased risk of lower respiratory tract infection (LRTI)
- Harm: none
- Benefits-harms assessment: strong preponderance of benefit over harm
- Policy level: strong recommendation

Evidence Profile 10b: Breastfeeding

- Aggregate evidence quality: C; observational studies
- Benefit: improved immunity, decreased risk of LRTI, improved nutrition
- Harm: implied inadequacy of mothers who cannot or prefer to not breastfeed
- Benefits-harms assessment: preponderance of benefit over harm
- Policy level: recommendation

Evidence Profile 11: Asking About complimentary alternative medicine (CAM)

- Aggregate evidence quality: D; expert opinion
- Benefit: improved parent-physician communication, awareness of other, possibly harmful treatments being used
- Harm: time required for discussion, lack of knowledge about CAM by many pediatricians
- Benefits-harms assessment: some benefit over harm
- Policy level: option

Evidence Based Grading Scale

A: Well-designed randomized controlled trials (RCTs) or diagnostic studies on relevant populations

B: RCTs or diagnostic studies with minor limitations; overwhelming consistent evidence from observational studies

C: Observational studies (Case-control and cohort design)

D: Expert opinion, case reports, reasoning from first principles

X: Exceptional situations in which validating studies cannot be

	performed and there is a clear preponderance of benefit or harm **Levels of Recommendations** **Strong recommendation**: A strong recommendation in favor of a particular action is made when the anticipated benefits of the recommended intervention clearly exceed the harms (as a strong recommendation against an action is made when the anticipated harms clearly exceed the benefits) and the quality of the supporting evidence is excellent. In some clearly identified circumstances, strong recommendations may be made when high-quality evidence is impossible to obtain and the anticipated benefits strongly outweigh the harms. **Recommendation**: A recommendation in favor of a particular action is made when the anticipated benefits exceed the harms but the quality of evidence is not as strong. Again, in some clearly identified circumstances, recommendations may be made when high quality evidence is impossible to obtain but the anticipated benefits outweigh the harms. **Option**: Options define courses that may be taken when either the quality of evidence is suspect or carefully performed studies have shown little clear advantage to one approach over another. **No recommendation**: No recommendation indicates that there is a lack of pertinent published evidence and that the anticipated balance of benefits and harms is presently unclear.
CCHMC (2006)	**Evidence Grading Scale**: A: Randomized controlled trial: large sample B: Randomized controlled trial: small sample C: Prospective trial or large case series D: Retrospective analysis E: Expert opinion or consensus F: Basic laboratory research S: Review article M: Meta-analysis Q: Decision analysis L: Legal requirement O: Other evidence X: No evidence
SIGN (2006)	G**rades of Recommendation** Note: The grade of recommendation relates to the strength of the evidence on which the recommendation is based. It does not reflect the clinical importance of the recommendation.

A: At least one meta-analysis, systematic review of randomized controlled trials (RCTs), or RCT rated as 1++ and directly applicable to the target population; or

A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results

B: A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or

Extrapolated evidence from studies rated as 1++ or 1+

C: A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or

Extrapolated evidence from studies rated as 2++

D: Evidence level 3 or 4; or

Extrapolated evidence from studies rated as 2+

Good Practice Points: Recommended best practice based on the clinical experience of the guideline development group

Levels of Evidence

1++: High quality meta-analyses, systematic reviews of randomised controlled trials (RCTs), or RCTs with a very low risk of bias

1+: Well-conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias

1-: Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias

2++: High quality systematic reviews of case control or cohort studies

High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal

2+: Well-conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal

	2-: Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal **3**: Non-analytic studies (e.g. case reports, case series) **4**: Expert opinion

GUIDELINE CONTENT COMPARISON

The American Academy of Pediatrics (2006), Cincinnati Children's Hospital Medical Center (CCHMC) and Scottish Intercollegiate Guidelines Network (SIGN) present recommendations for the diagnosis and treatment of pediatric bronchiolitis and provide explicit reasoning behind their judgments.

The guidelines are fairly similar in scope, addressing the prevention, diagnosis and treatment of pediatric bronchiolitis. AAP and SIGN reviewed the CCHMC guideline in developing their recommendations.

Guideline Methodology

AAP differs from CCHMC and SIGN in the fact that it partnered with the Agency for Healthcare Research and Quality (AHRQ) and the Research Triangle Institute (RTI) International-University of North Carolina Evidence-Based Practice Center (EPC) to develop an evidence report (see "Availability of Companion Documents" in the NGC summary of this guideline). In terms of methods used to collect/select the evidence, all three groups provide relevant information about the databases and literature that was searched. Regarding the methods used to assess the quality and strength of the evidence, all three groups performed weighting of the evidence according to a rating scheme. AAP and SIGN performed a systematic review with evidence tables to analyze the evidence; CCHMC performed a review of published meta-analyses. All three groups used expert consensus to formulate their recommendations, with AAP and SIGN using a rating scheme to grade the strength of their recommendations. All three groups provide reference lists (166 for AAP, 85 for CCHMC and 110 for SIGN) and disclose potential conflicts of interest.

Areas of Agreement

Prevention/Transmission Reduction

The three guideline groups are in agreement that routine use of the prophylactic therapy Palivizumab is not recommended, but that it may be considered for use, on a case by case basis, in selected infants with high risk factors such as prematurity, congenital heart disease, chronic lung disease or immune deficiency syndromes.

There is overall agreement between the guidelines that breastfeeding and reducing infants' exposure to secondhand tobacco smoke are key steps in reducing the risk of respiratory syncytial virus (RSV)-related hospitalization. Hand decontamination is acknowledged by all three groups as the most effective measure in preventing nosocomial spread of RSV. AAP states that hands should be decontaminated before and after direct contact with patients, after contact with inanimate objects in the direct vicinity of the patient, and after removing gloves. Other measures such as covering the nose and eyes with a mask (CCHMC) or wearing gloves and plastic aprons or gowns (SIGN) are recommended to reduce the risk of transmission. SIGN makes ward-based recommendations, such as isolating the infected patient, implementing policies to restrict hospital visiting by those with symptoms of respiratory infections, and performing ongoing surveillance by control of infection staff to monitor compliance with infection control procedures.

Physical Examination

AAP, CCHMC and SIGN agree that the diagnosis of bronchiolitis should be made on the basis of history and physical examination, and that routine use of diagnostic testing is not recommended. The groups further agree that clinical signs and symptoms of bronchiolitis may include increased respiratory effort, inspiratory crackles, wheezing, rhinorrhea, tachypnea, and nasal flaring.

Diagnostic Testing

There is overall agreement between the guideline groups that clinicians should not routinely order laboratory and radiologic studies to establish a diagnosis of bronchiolitis. The three groups agree that while not recommended for routine use, a chest x-ray may be helpful if there is diagnostic uncertainty. SIGN differs from AAP and CCHMC in recommending that pulse oximetry be performed in every child who is admitted to a hospital with acute bronchiolitis. CCHMC states that pulse oximetry may be obtained as clinically indicated for selected patients. The groups agree that rapid virologic testing may be useful when adequate isolation facilities are not available (AAP, SIGN) or to prevent unnecessary additional workup in selected, very young infants (CCHMC). CCHMC and SIGN agree that capillary or arterial blood gas analysis may be useful in selected patients, for example in infants with severe respiratory distress who are tiring and may be entering respiratory failure (SIGN).

Pharmacologic Therapy

The three guidelines agree that routine use of bronchodilator medications (including beta 2 agonists, epinephrine, and anticholinergics such as ipratropium); antibiotics (in the absence of specific indications of the coexistence of a bacterial infection); corticosteroids; and the antiviral drug Ribavirin cannot be recommended. AAP adds that ribavirin may, however, be considered for use in highly specific situations involving documented RSV bronchiolitis with severe disease or in those who are at risk for severe disease.

AAP and CCHMC state that it in certain patients it may be reasonable to administer a trial of a nebulized bronchodilator medication such as epinephrine or albuterol and to evaluate clinical response. AAP states that while epinephrine may

be the preferred bronchodilator for this trial in the emergency department and in hospitalized patients, it is usually not used in the home setting, and that albuterol/salbutamol would therefore be more appropriate in the office or clinic setting. CCHMC similarly notes that there is a lack of research regarding the appropriateness of routine epinephrine use outside the acute care setting, and adds that the expected disposition of a patient may influence the choice of beta-agonist when a single administration trial is given. Both groups agree that the patient should be assessed both pre- and post-therapy using an objective documentation tool, and both cite available tools for this use. Both groups also agree that the bronchodilators should be continued only if there is a documented positive clinical response.

Non-Pharmacologic Therapy

There is agreement between all three groups that chest physiotherapy should not be used routinely in the management of bronchiolitis. Nasal suctioning is cited as an appropriate step by all three groups to provide relief of nasal congestion. CCHMH also recommends the infant be suctioned (when clinically indicated) before feedings, as needed, and prior to each inhalation therapy. They note that for infants undergoing inhalation therapy, suctioning itself may improve respiratory status such that inhalation therapy is not necessary, and that suctioning may improve the delivery of the inhalation treatment.

All three groups recommend initiating supplemental oxygen for infants whose oxyhemoglobin saturation levels fall below a certain point, but provide slightly different SpO_2 percentages: <90% (AAP), <91% (CCHMC), and $\leq$92% (SIGN). AAP states that oxygen may be discontinued if SpO_2 is at or above 90% and the infant is feeding well and has minimal respiratory distress. CCHMC notes that weaning of oxygen should be considered when consistently higher than 94%. AAP and CCHMC agree that as the child's clinical course improves, continuous measurement of SpO_2 is not routinely needed. CCHMC recommends scheduled spot checks of pulse oximetry.

The three guidelines are in agreement that patients' hydration and ability to take fluids orally should be assessed and that maintaining adequate hydration is essential. AAP notes that intravenous fluids are appropriate for children who cannot maintain oral intake or hydrations; SIGN recommends nasogastric feeding for this purpose.

Discharge Criteria

The two guidelines that address hospital discharge criteria, CCHMC and SIGN, agree that infants should not be discharged until they can maintain an adequate daily oral intake. SIGN notes that this should be >75% of usual intake. Both groups also agree that measures should be taken for infants who have undergone oxygen therapy, and both provide recommendations for verifying stability in terms of respiratory status.

Education

There is overall agreement that family members and carers should be provided information on their child's condition, its treatment, and prognosis. The groups

also agree that both families and healthcare professionals should be educated about important prevention/transmission reduction techniques, such as handwashing.

Follow-Up Care and Referral

CCHMC and SIGN provide recommendations for recognition of symptoms that should prompt hospital referral/acute pediatric assessment, including increased respiratory rate and/or effort, poor fluid intake, and worsening general appearance. SIGN provides additional recommendations regarding the need for hospital referral and indications for high dependency/intensive care unit consultation.

Areas of Differences

There are no significant areas of difference between the guidelines.

Conclusion

There is general agreement across the guidelines that breastfeeding, reduced exposure to tobacco smoke, and hand decontamination are important preventive/transmission reduction measures to take. There is also agreement that diagnosis should be based primarily on history and physical examination, and that routine diagnostic testing is not recommended. There is agreement that the routine use of pharmacologic agents such as bronchodilator medications, antibiotics, and corticosteroids are not recommended. A trial of a bronchodilator medication may be appropriate for selected patients (AAP and CCHMC). All groups recommend the use of supplemental oxygen when saturation levels fall below a certain point.

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